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MODIFICATION OF ARMORED FOOTWEAR (SABOT)

Reported by: Edward C. Grahn

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U. S. ARMY PROSTHETICS RESEARCH LABORATORY  
WALTER REED ARMY MEDICAL CENTER  
WASHINGTON 12, D. C.

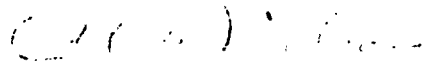
T.R. No. 3310\*

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Date Started: October 1962

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Recommend Approval:

  
\_\_\_\_\_  
Acting Scientific Director

Approved:

  
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Director

\*Qualified requesters may obtain copies of this report from ASTIA.

T.R. No. 6310

A B S T R A C T

A bracing system was designed for the armored footwear (Sabot) to coincide with the anatomical ankle axis and to give the wearer freedom of movement and ease of donning, with decreased fatigue.

## I. INTRODUCTION

In October 1962 the Army Prosthetics Research Laboratory received a pair of armored footwear (Sabots) originally developed by the Marine Corps (Naval Medical Field Research Laboratory) to protect personnel engaged in mine clearance operations. The laboratory was to study the design modification possibilities with the primary purpose of providing enhanced comfort with ease of donning.

## II. DISCUSSION

The bracing system of the Sabot as received from the Marine Corps did not coincide with the anatomical ankle axis, nor was the calf cuff comfortable. The donning procedure was somewhat difficult and thus slow (see Fig 1). Therefore, the three modifications necessary were relocation of the ankle axis, a more comfortable calf cuff, and a simplified system of attachment to the combat boot.

Since the location of the anatomical ankle axis varies from person to person it would be impossible to have a perfectly coincident mechanical ankle axis without custom fabricating each individual Sabot. However, the ankle measurement of several people whose shoe sizes were within the range of this particular size Sabot (medium) indicated a variance of only  $1/4$ " in height. With the present standard combat boot, this amounts to an average height of  $4\frac{1}{2}$ ". The mechanical ankle axis was set at this height (see Fig. 3). In the Sabot as received this height was  $3-1/16$ ".

The ankle axis of the original Sabot was set at  $90^\circ$  to the longitudinal axis of the foot. The anatomical axis is actually rotated externally  $10-15^\circ$  from this<sup>1/</sup> (see Fig. 2). Again taking the average, the axis was set at approximately  $12.5^\circ$ , i.e., the medial pivot was set  $7/8$ " anterior to the lateral pivot with  $3-7/8$ " between pivots (see Fig. 3). The original distance between pivots was  $3-1/3$ " but this interfered with the malleoli during walking.

The calf cuff height and radius of curvature were unchanged but the width was increased from 2 to  $2\frac{1}{2}$ ". The inside surface was lined with  $1/8$ " felt and covered with horsehide.

The donning method was entirely redesigned (see Fig. 3). Major problems of the original system were: difficulty in placing the boot under the short strapping (which was inherent in the design) and difficulty in placing the retaining lugs on the boot welt.

<sup>1/</sup> Brace Alignment Considerations, p. 4, Prosthetics & Orthotics, New York University Post-Graduate Medical School, 1962.

The redesigned system consisted of separate straps at the toe and at the ankle, and a "D" ring was added to the lateral side at the ankle to provide an easier access for the strap. "Velcro" replaced the buckle method. Provisions were made to permit the retaining lugs to swing clear during donning (see Fig. 4). The strap at the calf cuff was also replaced with "Velcro."

### III. CONCLUSION

The modifications discussed above fulfill the primary purpose of the project by relocating the ankle axis, providing a more comfortable calf cuff, and simplifying the system of attachment to the combat boot.

This report concerns the Sabot size classified as "medium", but could be projected to the other sizes necessary to fit all the personnel engaged in mine clearance work.

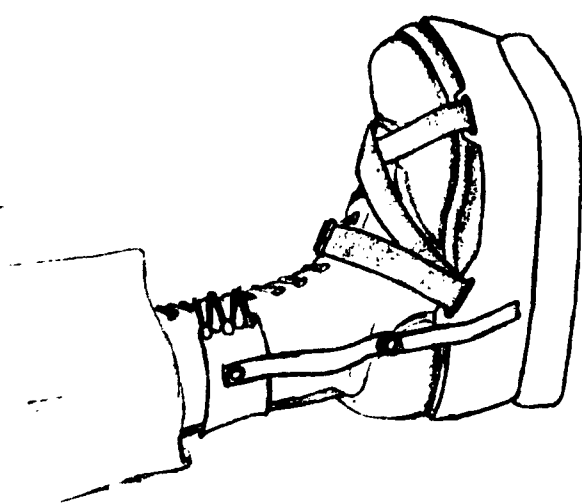
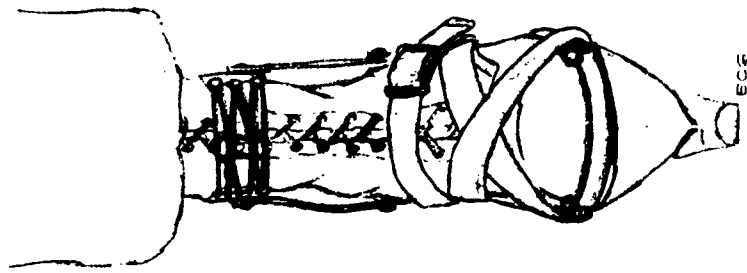


Fig 1 Armored Footwear (Left Foot) Original Model.



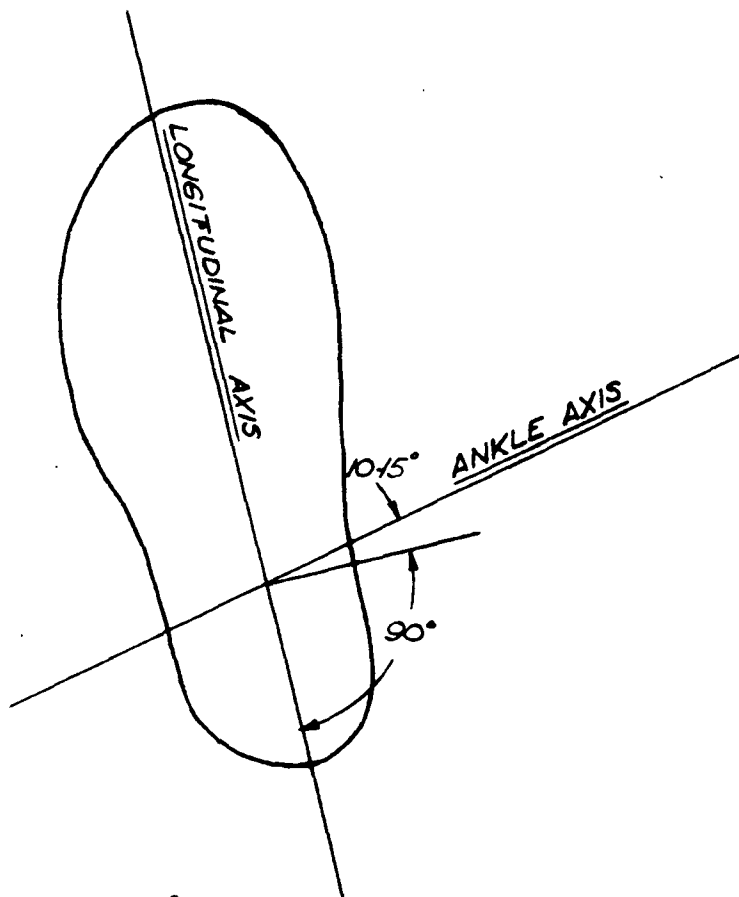
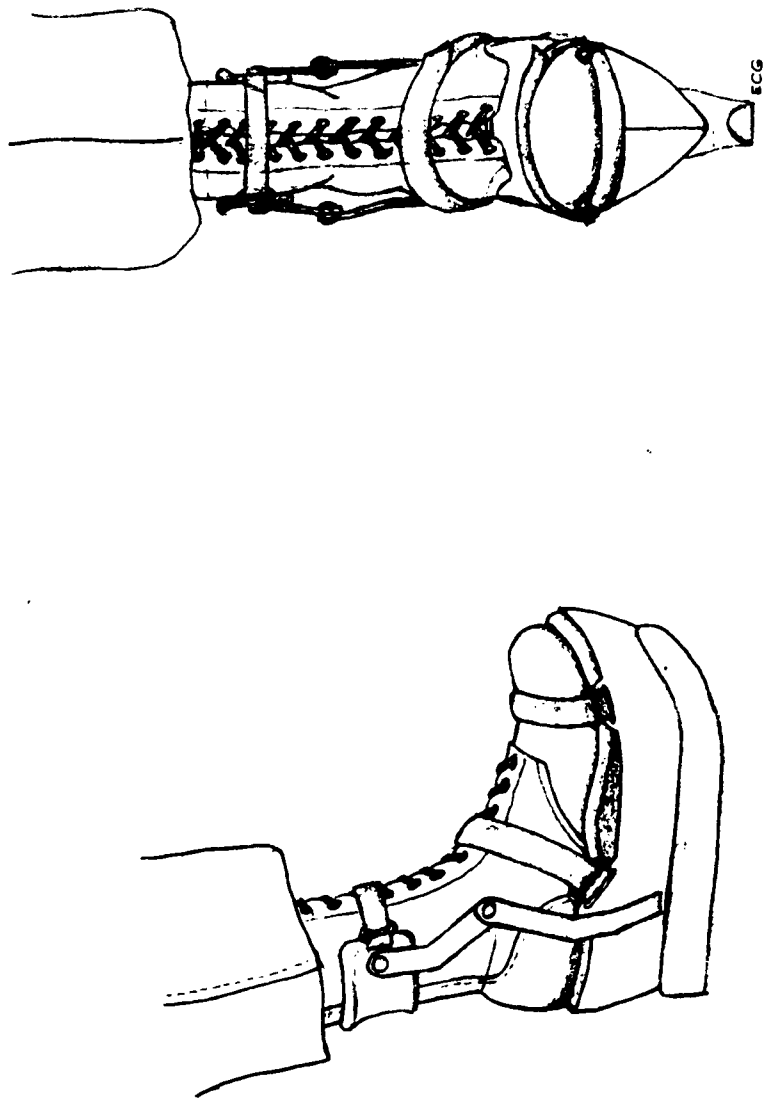
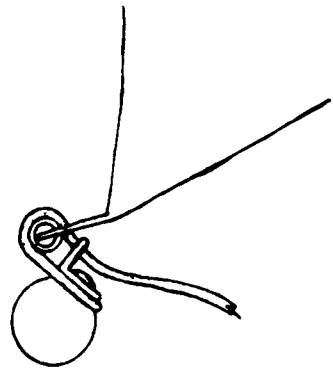
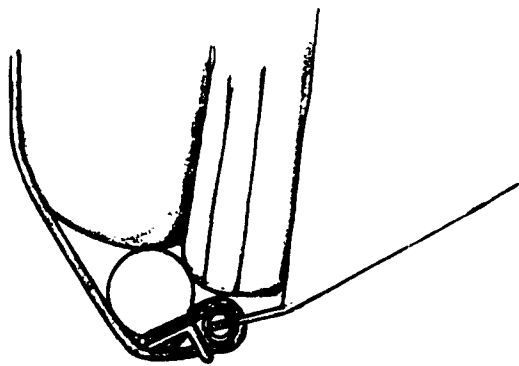


Fig 2 Ankle Axis in Relation to Longitudinal Axis of Foot.



**Fig 3 Armored Footwear (Left Foot) - Modified Model.**



**Fig 4 Retaining Lug Clamping Boot Toe, Left, and Swung Clear, Right.**

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